Stephen J. McGuire

University of Colorado
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Education

The University of Colorado at Boulder Boulder, CO • PhD student in Aerospace Engineering Systems
• Selected Coursework:

Controls State-Space Controls · Frequency Controls · Estimation

Robotics Human-Robot Interaction · Machine Vision · Perception

The Pennsylvania State University University Park, PA • Bachelor of Science, major in Computer Engineering, minor in Math, 2003
• Selected Coursework:

Computer Engineering Unix Programming · Data Structures · Computer Architecture · Computer Networks · Operating Systems · Algorithms · Object Oriented Systems · Artificial Intelligence · Microcontrollers · FPGA Design · VLSI/VHDL Design

Mathematics Multivariable Calculus · Linear Algebra · Numerical Methods · High-Performance Computing

Work History

The University of Colorado at Boulder (August 2015 - present)
Graduate Research Fellow
Research Interests:

- Human-robot teaming with particular focus on issues in planetary exploration
- Statistical methods of recovering from autonomy failures
- Self-calibration of intrinsic and extrinsic properties of sensors

The University of Colorado at Boulder (January 2015 - July 2015)
Graduate Student / Research Assistant

- Assisted with practical requirements of conducting field tests of research algorithms on actual mobile robots
- Reverse engineered a Linux acquisition layer for a newly released depth camera where the vendor only supports Windows 8.1
- Designed and implemented an integration layer between standalone vision research code and a ROS-based control system for entry into the Amazon Picking Challenge
- Designed a prototype system for exploring the use of miniature hydraulic controls in mobile robotics

The University of Colorado at Boulder (August 2014 - December 2014)
Graduate Student / Teaching Assistant

- Created assignments, grading rubrics, and instructional materials in support of a sophomore aerospace Matlab class
- Conducted several hours of one-on-one and small group instruction per week teaching basic techniques in Matlab

Astrobotic Technology, Inc. (November 2012 - August 2014)
Avionics Engineer

- Designed integrated hardware and software solutions needed to develop a Moon landing system, culminating in four months of field testing aboard a propulsive lander sponsored by NASA
- Flew local helicopter testing missions as precursors to propulsive lander testing
- Designed, implemented, and field tested a ARM7-based landing sensor data acquisition hardware system, including custom interface hardware and custom software extensions to a bare-metal RTOS written in C++
- Designed and implemented a 20x30x20 robotic gantry crane for simulating sub-Terran gravity, requiring authoring of specifications, interaction with external contractors, and custom software creation
- Co-authored several NASA proposals and served as technical contributor for Moon landing efforts
- Designed, implemented, and field tested a pit exploration robot for creating 3D models of lunar sinkholes via a suspended scanning lidar
- Earned rotorcraft certified flight instructor certificate

United States Marine Corps (January 2005 - July 2012)
Captain, Helicopter Pilot

- Qualified as a CH-53E Super Stallion heavy lift helicopter pilot
- Deployed in support of Operation Iraqi Freedom, 2009
- Served as squadron computer support personnel, responsible for system upkeep and creative computer problem solving
- Earned three individual decorations for custom software work, including a squadron flight schedule presentation system, a remote-site training support system, and a document management package
- Earned civilian flight qualifications in airplane single engine, airplane multi-engine, rotorcraft, and instrument privileges

ENSCO, Inc. (April 2004 - January 2005)
Software Engineer

- Designed sensor support software for ENSCO, Inc.'s DARPA Grand Challenge 2004 entry, including high-speed lidar and obstacle avoidance
- Created board-specific Linux kernel drivers to support a data acquisition requirement
- Diagnosed and improved a problematic networked remote-sensor application, enabling live monitoring of remote sensors via long-range networks
- Developed Geographic Information System workflows for data analysis using ESRI ArcGIS components under Java

The Pennsylvania State University Applied Research Laboratory (April 2002 - December 2003)
Undergraduate Research Assistant

- Designed and implemented robotic control software in a study of faults in complex systems using a robotic mine hunting exercise
- Designed and implemented a particle filter to detect faults in one single robot, then alert the team to be more sensitive to potential faults

NASA Ames Research Center (May 2001 - August 2001)
Robotics Undergraduate Student Researcher, Autonomy and Robotics Area, Code IC

- Oversaw hardware integration onto stock rover hardware, including mating a custom Carnegie Mellon University omnicam onto the Center's iRobot ATRV-Jr.
- Created a replacement Video4Linux video capture CORBA server to increase video capture performance with the *bttv* kernel driver by subwindowing video capture.
- Extended a multithreaded C++ framework using POSIX threading to support extensible hardware-independent rover control, allowing platform independence of robot code.
- Supported several area members' research projects by providing rover support and implementation of algorithms under test.

One Call Systems, Inc. (2000-2004)
Web Systems Integrator

- Designed and oversaw implementation of a multi-tiered framework for Geographic Information System management through the Internet, bridging a late '80s minicomputer to modern handheld and desktop systems.
- Ported a communications server from MS-DOS 3.3 to Windows 2000, spanning 15 years of technology advances and adding additional capabilities to the company product portfolio.

Honors and Awards

- Selected for a NASA Science and Technology Research Fellowship, 2015, *Augmented Reality Telepresence for Robotic Exploration*
- Selected for a NASA Science and Technology Research Fellowship, 2013
- Recipient of Air Medal, with Strike/Flight Numeral 1 for combat missions flown in support of Operation Iraqi Freedom
- Awarded Navy and Marine Corps Achievement Medal, 3x, for development of custom software designed to streamline squadron operations.
- Graduated *cum laude* from The Pennsylvania State University's Schreyer Honors College
- Earned a national student appointment to NASA Ames Research Center, Code IC, Autonomy and Robotics Area through the Undergraduate Student Research Program

Papers and Publications

- Steve McGuire, Padraig Michael Furlong, Christoffer Heckman, Simon Julier, and Nisar Ahmed, *Failure is Not an Option: Policy Learning for Adaptive Recovery in Space Operations.* Submitted to IEEE Robotics and Automation Letters, July 2018, vol 3, issue 3, pp 1639-1646, DOI: 10.1109/LRA.2018.2801468 .
- Steve McGuire, Padraig Michael Furlong, Christoffer Heckman, Simon Julier, Daniel Szafir, and Nisar Ahmed. *Teamwork Across the Stars: Machine Learning to Overcome the Brittleness of Autonomy.* IROS Workshop on Human-Robot Collaboration: Towards Co-Adaptive Learning Through Semi-Autonomy and Shared Control, Daejon, Korea, 2016.
- Lu Ma, Juan M. Falquez, Steve McGuire & Gabe Sibley. *Large Scale Dense Visual Inertial SLAM.* Field and Service Robotics (FSR), 2015
- *Multiple Robot Fault Diagnosis Using Decision-Theoretic Particle Filters.* Undergraduate Honors Thesis, The Pennsylvania State University, 2003.
- *A Modular Multi-Function Rover and Control System for EVA*. Presented at the Fifth Annual Mars Society Convention, Boulder, CO, 2002.
- *A Framework for Distributed Rover Control and Three Sample Applications.* NASA Ames Research Center, Code IC, Computational Sciences Division Paper Number 298, 2001.